1   What is claimed is:

2   1.   A method for monitoring performance of an advanced

3   process control system for at least one static process

4   output, the method comprising the steps of:

5   receiving process performance data for the at least one

6   static process output;

7   comparing the process performance data to at least one

8   of a predicted value for the process performance and a

9   target value for the process performance;

10   calculating at least one index that reflects comparison

11   of the process performance data to the at least one of the

12   predicted value for the process performance and the target

13   value for the process performance; and

14   indicating the results of the calculation based on the

15   at least one index, wherein the results indicate a status of

16   the advanced process control system.

17   2.   The method of claim 1, wherein the step of

18   indicating the results of the calculation comprises at least

19   one of sending an indication to a controller that the at

20   least one index is beyond an acceptable point, halting

21   processing of the at least one process output if the at

22   least one index is beyond an acceptable point, and storing

23   the at least one index as an indication of the processing

24   performance of the at least one process output.

1   3.   The method of claim 2, wherein sending an

2   indication to a controller further comprises sending at

3   least one of a page, an electronic mail message, and a

4   message to a wireless personal data assistant.

5   4.   The method of claim 1, wherein performing the step

6   of indicating the results further comprises displaying the

7   at least one index in a visual output to allow a controller

8   to assess the process performance of the at least one

9   process output.

10   5.   A method for monitoring performance of an advance

11   process control system for at least one process output, the

12   method comprising the steps of:

13   receiving process performance data for the at least one

14   process output;

15   calculating at least one of a model health index,

16   wherein the model health index indicates an estimate of an

17   ability of a model to predict the behavior of the at least

18   one process output as compared to an expected output, and a

19   process health index, wherein the process health index

20   indicates an estimated probability of violation by the at

21   least one process output of predefined specification limits;

22   and

23   indicating the results of the calculation based on the

24   at least one of the model health index and the process

25   health index.

1   6.   The method of claim 5, wherein the step of

2 calculating the model health index further comprises the

3 steps of:

4   calculating a variance of a prediction error for a

5 processing performance of the at least one process output;

6 and

7   calculating a ratio of an estimate of a standard

8 deviation of the prediction error to an expected estimate of

9 the prediction error, wherein the standard deviation of the

10 prediction error is derived from the variance of the

11 prediction error.

12   7.   The method of claim 6, wherein the variance of the

13 prediction error indicates a bias between an actual output

14 of the at least process output and the expected output.

15   8.   The method of claim 6, wherein the variance of the

16 prediction error is based on an exponentially weighted

17 moving average.

18   9.   The method of claim 6, wherein the estimate of the

19 standard deviation of the prediction error is based on an

20 exponentially weighted moving average.

21   10. The method of claim 5, wherein the step of

22 calculating the process health index further comprises the

23 steps of:

1   calculating a probability for violating specification

2 limits of a processing performance of the at least one

3 process output; and

4   calculating a ratio of the probability for violating

5 the specification limits to a specified probability limit.

6   11. The method of claim 6, wherein the step of

7 calculating the process health index further comprises the

8 step of calculating a variance of a target deviation for the

9 processing performance of the at least one process output,

10 wherein the variance of the target deviation indicates a

11 bias between an actual output of the at least one process

12 output and a target output.

13   12. The method of claim 11, wherein the variance of

14 the target deviation is based on an exponentially weighted

15 moving average.

16   13. The method of claim 5, further comprising the step

17 of performing a notification function, wherein the

18 notification function comprises sending an indication to a

19 controller that the at least one of the model health index

20 and the process health index is beyond an acceptable point.

21   14. The method of claim 13, wherein sending an

22 indication to a controller further comprises sending at

23 least one of a page, an electronic mail message, and a

24 message to a wireless personal data assistant.

1   15. The method of claim 5, further comprising the step

2 of performing a notification function, wherein the

3 notification function comprises halting processing of the at

4 least one process output if the at least one of the model

5 health index and the process health index is beyond an

6 acceptable point.

7   16. The method of claim 5, further comprising the step

8 of performing a notification function, wherein the

9 notification function further comprises displaying the at

10 least one of the model health index and the process health

11 index in a visual display to allow a controller to assess

12 the process performance of the at least one process output.

13   17. The method of claim 5, further comprising the step

14 of performing a notification function, wherein the

15 notification function comprises storing the at least one of

16 the model health index and the process health index, such

17 that the at least one of the model health index and the

18 process health index serves as an indication of the

19 processing performance of the at least one process output.

20   18. The method of claim 17, wherein the notification

21 function further comprises displaying the stored at least

22 one of the model health index and the process health index

23 in a visual display to allow a controller to assess the

24 process performance of the at least one process output.

1   19.   A method for monitoring performance of an advanced

2 process control system for at least one process output, the

3 method comprising the steps of:

4   calculating at least one of a variance of a prediction

5 error for a processing performance of the at least one

6 process output and a probability for violating specification

7 limits of the processing performance of the at least one

8 process output, wherein the at least one of the variance and

9 the probability are based on an exponentially weighted

10 moving average;

11   if the variance of the prediction error is calculated,

12 calculating a model health index, wherein the model health

13 index is a ratio of an exponentially weighted moving

14 average-based estimate of a standard deviation of the

15 prediction error to an expected estimate of the prediction

16 error, and wherein the exponentially weighted moving

17 average-based estimate of the standard deviation of the

18 prediction error is derived from the variance of the

19 prediction error;

20   if the probability for violating specification limits

21 is calculated, calculating a process health index, wherein

22 the process health index is a ratio of the probability for

23 violating the specification limits to a specified

24 probability limit; and

1   indicating the results of the calculation based on at

2   least one of the model health index and the process health

3   index.

4   20. The method of claim 19, further comprising the

5   step of performing a notification function, wherein the

6   notification function comprises sending an indication to a

7   controller that the at least one of the model health index

8   and the process health index is beyond an acceptable point.

9   21. The method of claim 20, wherein sending an

10   indication to a controller further comprises sending at

11   least one of a page, an electronic mail message, and a

12   message to a wireless personal data assistant.

13   22. The method of claim 19, further comprising the

14   step of performing a notification function, wherein the

15   notification function comprises halting processing of the at

16   least one process output if the at least one of the model

17   health index and the process health index is beyond an

18   acceptable point.

19   23. The method of claim 19, further comprising the

20   step of performing a notification function, wherein the

21   notification function further comprises displaying the at

22   least one of the model health index and the process health

23   index in a visual display to allow a controller to assess

24   the process performance of the at least one process output.

1   24. The method of claim 19, further comprising the

2 step of performing a notification function, wherein the

3 notification function comprises storing the at least one of

4 the model health index and the process health index, such

5 that the at least one of the model health index and the

6 process health index serves as an indication of the

7 processing performance of the at least one process output.

8   25. The method of claim 24, wherein the notification

9 function further comprises displaying the at least one of

10 the model health index and the process health index in a

11 visual display to allow a controller to assess the process

12 performance of the at least one process output.

13   26. A method for monitoring performance of an advanced

14 process control system for at least one process output, the

15 method comprising the steps of:

16   receiving process performance data for the at least one

17 process output;

18   calculating at least one of a current model health

19 index, wherein the current model health index indicates an

20 estimate of an ability of a model to predict the behavior of

21 a current one of the at least one process output as compared

22 to an expected output, and a current process health index,

23 wherein the current process health index indicates an

24 estimated probability of violation by a current one of the

1   at least one process output of predefined specification

2   limits;

3   if the current model health index is calculated,

4   calculating a subsequent model health index, wherein the

5   subsequent model health index indicates an estimate of an

6   ability of a model to predict the behavior of a subsequent

7   one of the at least one process output as compared to an

8   expected output;

9   if the subsequent model health index is calculated,

10   storing the current model health index and the subsequent

11   model health index, such that comparing the current model

12   health index and the subsequent model health index give an

13   indication of a processing performance of the at least one

14   process output;

15   if the current process health index is calculated,

16   calculating a subsequent process health index, wherein the

17   subsequent process health index indicates an estimated

18   probability of violation by a subsequent one of the at least

19   one process output of predefined specification limits; and

20   if the subsequent process health index is calculated,

21   storing the current process health index and the subsequent

22   process health index, such that comparing the current

23   process health index and the current process health index

24   gives an indication of the processing performance of the at

25   least one process output.

1   27. A method for monitoring performance of an advanced

2   process control system for at least one process output, the

3   method comprising the steps of:

4   calculating at least one of a current variance of a

5   prediction error for a processing performance of the at

6   least one process output and a current probability for

7   violating specification limits of the processing performance

8   of the at least one process output, wherein the at least one

9   of the current variance and the current probability are

10   based on an exponentially weighted moving average;

11   if the current variance of the prediction error is

12   calculated, calculating a current model health index,

13   wherein the current model health index is a ratio of a

14   current exponentially weighted moving average-based estimate

15   of a standard deviation of the prediction error to an

16   expected estimate of the prediction error, and wherein the

17   current exponentially weighted moving average-based estimate

18   of the standard deviation of the prediction error is derived

19   from the current variance of the prediction error;

20   if the current model health index is calculated,

21   calculating a subsequent model health index, wherein the

22   subsequent model health index is calculated in a

23   substantially similar manner to the current model health

24   index;

1   if the subsequent model health index is calculated,

2 storing the current model health index and the subsequent

3 model health index, such that comparing the current model

4 health index and the subsequent model health index gives an

5 indication of the processing performance of the at least one

6 process output;

7   if the current probability for violating specification

8 limits is calculated, calculating a current process health

9 index, wherein the current process health index is a ratio

10 of the probability for violating the specification limits to

11 a probability limit;

12   if the current process health index is calculated,

13 calculating a subsequent process health index, wherein the

14 subsequent process health index is calculated in a

15 substantially similar manner to the current process health

16 index; and

17   if the subsequent process health index is calculated,

18 storing the current process health index and the subsequent

19 process health index, such that comparing the current

20 process health index and the subsequent process health index

21 gives an indication of the processing performance of the at

22 least one process output.

23   28. A method for monitoring performance of an advanced

24 process control system for a plurality of process outputs,

25 the method comprising the steps of:

1   calculating at least one of a first model health index

2 of a process performance of a first one of the plurality of

3 process outputs and a first process health index of the

4 process performance of the first one of the plurality of

5 process outputs;

6   calculating at least one of a second model health index

7 of the process performance of a second one of the plurality

8 of process outputs and a second process health index of the

9 process performance of the second one of the plurality of

10 process outputs;

11   if the first model health index and the second model

12 health index are calculated, calculating an aggregate model

13 health index of the process performance of the plurality of

14 process outputs; and

15   if the first process health index and the second

16 process health index are calculated, calculating an

17 aggregate process health index of the process performance of

18 the plurality of process outputs.

19   29. The method of claim 28, wherein the aggregate

20 model health index is calculated using a geometric mean of

21 the first model health index and the second model health

22 index and the aggregate process health index is calculated

23 using a geometric mean of the first process health index and

24 the second process health index.

25   30. The method of claim 28, further comprising:

1   calculating at least one of an nth, where n is a number

2   greater than three, model health index of a process

3   performance of a nth one of the plurality of process outputs

4   and a nth process health index of the process performance of

5   the nth one of the plurality of process outputs;

6   if the first model health index, the second model

7   health index are calculated, and the nth model health index

8   are calculated, calculating the aggregate model health index

9   of the process performance of the plurality of process

10   outputs; and

11   if the first process health index, the second process

12   health index, and the nth process health index are

13   calculated, calculating the aggregate process health index

14   of the process performance of the plurality of process

15   outputs.

16   31. The method of claim 30, wherein the aggregate

17   model health index is calculated using a geometric mean of

18   the first model health index, the second model health index,

19   and the nth model health index and the aggregate process

20   health index is calculated using a geometric mean of the

21   first process health index, the second process health index,

22   and the nth process health index.

23   32. A method for monitoring performance of an advanced

24   process control system for at least one process output, the

25   method comprising the steps of:

1   estimating a process deviation, wherein the process

2   deviation indicates deviation of a process performance from

3   at least one of a target process performance and a model of

4   the process performance;

5   characterizing a current estimate of the process

6   performance using at least one of a first index that

7   represents the deviation of the process performance from the

8   target process performance and a second index that

9   represents the deviation of the model performance from a

10   specified model performance; and

11   performing a notification function based on the value

12   of at least one of the first index and the second index.

13   33. A system for monitoring performance of an advanced

14   process control system for at least one process output,

15   comprising:

16   a first memory that stores at least one of a predicted

17   value for process performance of the at least one process

18   output and a target value for process performance of the at

19   least one process output;

20   a second memory that stores process performance data of

21   the at least one process output;

22   a third memory that stores at least one of a model

23   health algorithm and a process health algorithm, wherein the

24   model health algorithm is used to calculate a model health

1   index of the process performance and the process health

2   algorithm is used to calculate a process health index of the

3   process performance; and

4   a processor, operably connected to the first memory,

5   the second memory and the third memory, that calculates at

6   least one of the model health index using the model health

7   algorithm and the process health index using the process

8   health algorithm, wherein the model health index is

9   calculated based on a comparison of the predicted value and

10   the process performance data of the at least one process

11   output, and wherein the process health index is calculated

12   based on a comparison of the target value and the process

13   performance data of the at least one process output.

14   34. The system of claim 33, further comprising a user

15   input interface that receives the at least one of the

16   predicted value for process performance of the at least one

17   process output and the target value for the process

18   performance of the at least one process output and stores

19   the at least one of the predicted value and the target value

20   in the first memory.

21   35. The system of claim 33, wherein the processor is

22   capable of halting processing of the at least one process

23   output if the at least one of the model health index and the

24   process health index is beyond an acceptable point.

1   36. The system of claim 33, further comprising a

2 communications interface, wherein the processor is capable

3 of sending a notification message to a controller if the at

4 least one of the model health index and the process health

5 index is beyond an acceptable point.

6   37. The system of claim 36, wherein the communications

7 interface is at least one of a radio transmitter and a

8 communications port.

9   38. The system of claim 36, wherein the notification

10 message comprises at least one of a page, an electronic mail

11 message, and a message to a wireless personal data

12 assistant.

13   39. The system of claim 33, further comprising a

14 fourth memory that stores the at least one of the model

15 health index and the process health index, such that the at

16 least one of the model health index and the process health

17 index serves as an indication of the processing performance

18 of the at least one process output.

19   40. The system of claim 33, further comprising a

20 display that displays the at least one of the model health

21 index and the process health index as a visual display, such

22 that the at least one of the model health index and the

23 process health index serves as an indication of the

24 processing performance of the at least one process output.

1   41. A system for monitoring performance of an advanced

2   process control system for at least one process output,

3   comprising:

4   first storage means for storing at least one of a

5   predicted value for process performance of the at least one

6   process output and a target value for process performance of

7   the at least one process output;

8   second storage means for storing process performance

9   data of the at least one process output;

10   third storage means for storing at least one of a model

11   health algorithm and a process health algorithm, wherein the

12   model health algorithm is used to calculate a model health

13   index of the process performance and the process health

14   algorithm is used to calculate a process health index cf the

15   process performance; and

16   processing means, operably connected to the first

17   storage means, the second storage means and the third

18   storage means, that calculates at least one of the model

19   health index using the model health algorithm and the

20   process health index using the process health algorithm,

21   wherein the model health index is calculated based on a

22   comparison of the predicted value and the process

23   performance data of the at least one process output, and

24   wherein the process health index is calculated based on a

1 comparison of the target value and the process performance

2 data of the at least one process output.

3   42. The system of claim 41, further comprising user

4 input means for receiving the at least one of the predicted

5 value for process performance of the at least one process

6 output and the target value for the process performance of

7 the at least one process output and storing the at least one

8 of the predicted value and the target value in the first

9 storage means.

10   43. The system of claim 41, further comprising control

11 interface means between the processor and the at least one

12 process output for enabling the processing means to halt

13 processing of the at least one process output if the at

14 least one of the model health index and the process health

15 index is beyond an acceptable point.

16   44. The system of claim 41, further comprising

17 communications interface means for enabling the processing

18 means to send a notification message to a controller if the

19 at least one of the model health index and the process

20 health index is beyond an acceptable point.

21   45. The system of claim 44, wherein the notification

22 message comprises at least one of a page, an electronic mail

23 message, and a message to a wireless personal data

24 assistant.

1   46. The system of claim 41, further comprising fourth

2   storage means for storing the at least one of the model

3   health index and the process health index, such that the at

4   least one of the model health index and the process health

5   index serves as an indication of the processing performance

6   of the at least one process output.

7   47. The system of claim 41, further comprising display

8   means for displaying the at least one of the model health

9   index and the process health index as a visual display, such

10   that the at least one of the model health index and the

11   process health index serves as an indication of the

12   processing performance of the at least one process output.

13   48. A system for monitoring performance of an advanced

14   process control system for at least one process output,

15   comprising:

16   means for receiving process performance data for the at

17   least one process output;

18   means for comparing the process performance data to at

19   least one of a predicted value for the process performance

20   and a target value for the process performance;

21   means for calculating at least one parameter that

22   reflects comparison of the process performance data to the

23   at least one of the predicted value for the process

24   performance and the target value for the process

25   performance; and

1   means for indicating the results of the calculation

2 based on the at least one parameter.

3   49. The system of claim 48, wherein indicating the

4 results of the calculation comprises at least one of sending

5 indication to a controller that the at least one parameter

6 is beyond an acceptable point, halting processing of the at

7 least one process output if the at least one parameter is

8 beyond an acceptable point, and storing the at least one

9 parameter as an indication of the processing performance of

10 the at least one process output.

11   50. A system for monitoring performance of an advanced

12 process control system for at least one process output,

13 comprising:

14   means for receiving process performance data for the at

15 least one process output;

16   means for calculating at least one of a model health

17 index, wherein the model health index indicates an estimate

18 of an ability of a model to predict the behavior of the at

19 least one process output as compared to an expected output,

20 and a process health index, wherein the process health index

21 indicates an estimated probability of violation by the at

22 least one process output of predefined specification limits;

23 and

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1   means for indicating the results of the calculation

2   based on the at least one of the model health index and the

3   process health index.

4   51.   A system for monitoring performance of an advanced

5   process control system for at least one process output, the

6   system comprising:

7   at least one tool, which measures the at least one

8   process output; and

9   a controller, coupled to the at least one tool, which

10   provides for central control of the at least one tool, the

11   controller implementing instructions for controlling the at

12   least one tool, the instructions comprising:

13   estimating a process deviation, wherein the

14   process deviation indicates deviation of a process

15   performance from at least one of a target process

16   performance and a model of the process performance;

17   characterizing a current estimate of the process

18   performance using at least one of a first index that

19   represents the deviation of the process performance from the

20   target process performance and a second index that

21   represents the deviation of the model performance from a

22   specified model performance; and

1   performing a notification function based on the

2   value of at least one of the first index and the second

3   index.

4   52.   The system of claim 51, wherein the controller is

5   a computer.

6   53.   A system for monitoring performance of an advanced

7   process control system for at least one process output, the

8   system comprising:

9   at least one tool, which measures the at least one

10   process output; and

11   a controller, coupled to the at least one tool, which

12   provides for central control of the at least one tool, the

13   controller implementing instructions for controlling the at

14   least one tool, the instructions comprising:

15   receiving process performance data for the at

16   least one process output;

17   comparing the process performance data to at least

18   one of a predicted value for the process performance and a

19   target value for the process performance;

20   calculating at least one parameter that reflects

21   comparison of the process performance data to the at least

22   one of the predicted value for the process performance and

23   the target value for the process performance; and

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1   indicating the results of the calculation based on

2   the at least one parameter.

3   54. A system for monitoring performance of an advanced

4   process control system for at least one process output, the

5   system comprising:

6   at least one tool, which measures the at least one

7   process output; and

8   a controller, coupled to the at least one tool, which

9   provides for central control of the at least one tool, the

10 controller implementing instructions for controlling the at

11 least one tool, the instructions comprising:

12   receiving process performance data for the at

13 least one process output;

14   calculating at least one of a model health index,

15 wherein the model health index indicates an estimate of an

16 ability of a model to predict the behavior of the at least

17 one process output as compared to an expected output, and a

18 process health index, wherein the process health index

19 indicates an estimated probability of violation by the at

20 least one process output of predefined specification limits;

21 and

22   indicating the results of the calculation based on

23 the at least one of the model health index and the process

24 health index.

1   55. A system for monitoring performance of an advanced

2   process control system for at least one process output, the

3   system comprising:

4   at least one tool, which measures the at least one

5   process output; and

6   a controller, coupled to the at least one tool, which

7   provides for central control of the at least one tool, the

8   controller implementing instructions for controlling the at

9   least one tool, the instructions comprising:

10   calculating at least one of a variance of a

11   prediction error for a processing performance of the at

12   least one process output and a probability for violating

13   specification limits of the processing performance of the at

14   least one process output, wherein the at least one of the

15   variance and the probability are based on an exponentially

16   weighted moving average;

17   if the variance of the prediction error is

18   calculated, calculating a model health index, wherein the

19   model health index is a ratio of an exponentially weighted

20   moving average-based estimate of a standard deviation of the

21   prediction error to an expected estimate of the prediction

22   error, and wherein the exponentially weighted moving

23   average-based estimate of the standard deviation of the

24   prediction error is derived from the variance of the

25   prediction error;

1   if the probability for violating specification limits

2   is calculated, calculating a process health index, wherein

3   the process health index is a ratio of the probability for

4   violating the specification limits to a specified

5   probability limit; and

6   performing a notification function based on at

7   least one of the model health index and the process health

8   index.

9   56. A system for monitoring performance of an advanced

10   process control system for at least one process output, the

11   system comprising:

12   at least one tool, which measures the at least one

13   process output; and

14   a controller, coupled to the at least one tool, which

15   provides for central control of the at least one tool, the

16   controller implementing instructions for controlling the at

17   least one tool, the instructions comprising:

18   receiving process performance data for the at

19   least one process output;

20   calculating at least one of a current model health

21   index, wherein the current model health index indicates an

22   estimate of an ability of a model to predict the behavior of

23   a current one of the at least one process output as compared

24   to an expected output, and a current process health index,

1   wherein the current process health index indicates an

2   estimated probability of violation by a current one of the

3   at least one process output of predefined specification

4   limits;

5   if the current model health index is calculated,

6   calculating a subsequent model health index, wherein the

7   subsequent model health index indicates an estimate of an

8   ability of a model to predict the behavior of a subsequent

9   one of the at least one process output as compared to an

10   expected output;

11   if the subsequent model health index is

12   calculated, storing the current model health index and the

13   subsequent model health index, such that comparing the

14   current model health index and the subsequent model health

15   index give an indication of a processing performance of the

16   at least one process output;

17   if the current process health index is calculated,

18   calculating a subsequent process health index, wherein the

19   subsequent process health index indicates an estimated

20   probability of violation by a subsequent one of the at least

21   one process output of predefined specification limits; and

22   if the subsequent process health index is

23   calculated, storing the current process health index and the

24   subsequent process health index, such that comparing the

25   current process health index and the current process health

1   index gives an indication of the processing performance of

2   the at least one process output.

3   57.   A system for monitoring performance of an advanced

4   process control system for at least one process output, the

5   system comprising:

6   at least one tool, which measures the at least one

7   process output; and

8   a controller, coupled to the at least one tool, which

9   provides for central control of the at least one tool, the

10 controller implementing instructions for controlling the at

11 least one tool, the instructions comprising:

12   calculating at least one of a current variance of

13 a prediction error for a processing performance of the at

14 least one process output and a current probability for

15 violating specification limits of the processing performance

16 the at least one process output, wherein the at least one of

17 the current variance and the current probability are based

18 on an exponentially weighted moving average;

19   if the current variance of the prediction error is

20 calculated, calculating a current model health index,

21 wherein the current model health index is a ratio of a

22 current exponentially weighted moving average-based estimate

23 of a standard deviation of the prediction error to an

24 expected estimate of the prediction error, and wherein the

25 current exponentially weighted moving average-based estimate

1 of the standard deviation of the prediction error is derived

2 from the current variance of the prediction error;

3   if the current model health index is calculated,

4 calculating a subsequent model health index, wherein the

5 subsequent model health index is calculated in a

6 substantially similar manner to the current model health

7 index;

8   if the subsequent model health index is

9 calculated, storing the current model health index and the

10 subsequent model health index, such that comparing the

11 current model health index and the subsequent model health

12 index gives an indication of the processing performance of

13 the at least one process output;

14   if the current probability for violating

15 specification limits is calculated, calculating a current

16 process health index, wherein the current process health

17 index is a ratio of the probability for violating the

18 specification limits to a probability limit;

19   if the current process health index is calculated,

20 calculating a subsequent process health index, wherein the

21 subsequent process health index is calculated in a

22 substantially similar manner to the current process health

23. index; and

24   if the subsequent process health index is

25 calculated, storing the current process health index and the

1   subsequent process health index, such that comparing the

2   current process health index and the subsequent process

3   health index gives an indication of the processing

4   performance of the at least one process output.

5   58. A system for monitoring performance of an advanced

6   process control system for at least one process output, the

7   system comprising:

8   at least one tool, which measures the at least one

9   process output; and

10   a controller, coupled to the at least one tool, which

11   provides for central control of the at least one tool, the

12   controller implementing instructions for controlling the at

13   least one tool, the instructions comprising:

14   calculating at least one of a first model health

15   index of a process performance of a first one of the

16   plurality of process outputs and a first process health

17   index of the process performance of the first one of the

18   plurality of process outputs;

19   calculating at least one of a second model health

20   index of the process performance of a second one of the

21   plurality of process outputs and a second process health

22   index of the process performance of the second one of the

23   plurality of process outputs;

1   if the first model health index and the second

2   model health index are calculated, calculating an aggregate

3   model health index of the process performance of the

4   plurality of process outputs; and

5   if the first process health index and the second

6   process health index are calculated, calculating an

7   aggregate process health index of the process performance of

8   the plurality of process outputs.

9   59. A computer-readable medium of instruction for

10   monitoring performance of an advanced process control system

11   for at least one process output, the instruction comprising:

12   receiving process performance data for the at least one

13   process output;

14   comparing the process performance data to at least one

15   of a predicted value for the process performance and a

16   target value for the process performance;

17   calculating at least one parameter that reflects

18   comparison of the process performance data to the at least

19   one of the predicted value for the process performance and

20   the target value for the process performance; and

21   indicating the results of the calculation based on the

22   at least one parameter.

1   60. A computer-readable medium of instruction for

2   monitoring performance of an advanced process control system

3   for at least one process output, the instruction comprising:

4   receiving process performance data for the at least one

5   process output;

6   calculating at least one of a model health index,

7   wherein the model health index indicates an estimate of an

8   ability of a model to predict the behavior of the at least

9   one process output as compared to an expected output, and a

10   process health index, wherein the process health index

11   indicates an estimated probability of violation by the at

12   least one process output of predefined specification limits;

13   and   .

14   indicating the results of the calculation based on the

15   at least one of the model health index and the process

16   health index.

17   61. A computer-readable medium of instruction for

18   monitoring performance of an advanced process control system

19   for at least one process output, the instruction comprising:

20   calculating at least one of a variance of a prediction

21   error for a processing performance of the at least one

22   process output and a probability for violating specification

23   limits of the processing performance of the at least one

24   process output, wherein the at least one of the variance and

1 the probability are based on an exponentially weighted

2 moving average;

3   if the variance of the prediction error is calculated,

4 calculating a model health index, wherein the model health

5 index is a ratio of an exponentially weighted moving

6 average-based estimate of a standard deviation of the

7 prediction error to an expected estimate of the prediction

8 error, and wherein the exponentially weighted moving

9 average-based estimate of the standard deviation of the

10 prediction error is derived from the variance of the

11 prediction error;

12   if the probability for violating specification limits

13 is calculated, calculating a process health index, wherein

14 the process health index is a ratio of the probability for

15 violating the specification limits to a specified

16 probability limit; and

17   indicating the results of the calculation based on at

18 least one of the model health index and the process health

19 index.

20   62. A computer-readable medium of instruction for

21 monitoring performance of an advanced process control system

22 for at least one process output, the instruction comprising:

23   63. A computer-readable medium of instruction for

24 monitoring performance of an advanced process control system

25 for at least one process output, the instruction comprising:

1   receiving process performance data for the at least one

2   process output;

3   calculating at least one of a current model health

4   index, wherein the current model health index indicates an

5   estimate of an ability of a model to predict the behavior of

6   a current one of the at least one process output as compared

7   to an expected output, and a current process health index,

8   wherein the current process health index indicates an

9   estimated probability of violation by a current one of the

10 at least one process output of predefined specification

11 limits;

12   if the current model health index is calculated,

13 calculating a subsequent model health index, wherein the

14 subsequent model health index indicates an estimate of an

15 ability of a model to predict the behavior of a subsequent

16 one of the at least one process output as compared to an

17 expected output;

18   if the subsequent model health index is calculated,

19 storing the current model health index and the subsequent

20 model health index, such that comparing the current model

21 health index and the subsequent model health index give an

22 indication of a processing performance of the at least one

23 process output;

24   if the current process health index is calculated,

25 calculating a subsequent process health index, wherein the

1 subsequent process health index indicates an estimated

2 probability of violation by a subsequent one of the at least

3 one process output of predefined specification limits; and

4   if the subsequent process health index is calculated,

5 storing the current process health index and the subsequent

6 process health index, such that comparing the current

7 process health index and the current process health index

8 gives an indication of the processing performance of the at

9 least one process output.

10   64. A computer-readable medium of instructions for

11 monitoring performance of an advanced process control system

12 for at least one process output, the instructions

13 comprising:

14   calculating at least one of a current variance of a

15 prediction error for a processing performance of the at

16 least one process output and a current probability for

17 violating specification limits of the processing performance

18 the at least one process output, wherein the at least one of

19 the current variance and the current probability are based

20 on an exponentially weighted moving average;

21   if the current variance of the prediction error is

22 calculated, calculating a current model health index,

23 wherein the current model health index is a ratio of a

24 current exponentially weighted moving average-based estimate

25 of a standard deviation of the prediction error to an

1   expected estimate of the prediction error, and wherein the

2   current exponentially weighted moving average-based estimate

3   of the standard deviation of the prediction error is derived

4   from the current variance of the prediction error;

5   if the current model health index is calculated,

6   calculating a subsequent model health index, wherein the

7   subsequent model health index is calculated in a

8   substantially similar manner to the current model health

9   index;

10   if the subsequent model health index is calculated,

11   storing the current model health index and the subsequent

12   model health index, such that comparing the current model

13   health index and the subsequent model health index gives an

14   indication of the processing performance of the at least one

15   process output;

16   if the current probability for violating specification

17   limits is calculated, calculating a current process health

18   index, wherein the current process health index is a ratio

19   of the probability for violating the specification limits to

20   a probability limit;

21   if the current process health index is calculated,

22   calculating a subsequent process health index, wherein the

23   subsequent process health index is calculated in a

24   substantially similar manner to the current process health

25   index; and

1   if the subsequent process health index is calculated,

2   storing the current process health index and the subsequent

3   process health index, such that comparing the current

4   process health index and the subsequent process health index

5   gives an indication of the processing performance of the at

6   least one process output.

7   65. A computer-readable medium of instructions for

8   monitoring performance of an advanced process control system

9   for at least one process output, the instructions

10 comprising:

11   calculating at least one of a first model health index

12 of a process performance of a first one of the plurality of

13 process outputs and a first process health index of the

14 process performance of the first one of the plurality of

15 process outputs;

16   calculating at least one of a second model health index

17 of the process performance of a second one of the plurality

18 of process outputs and a second process health index of the

19 process performance of the second one of the plurality of

20 process outputs;

21   if the first model health index and the second model

22 health index are calculated, calculating an aggregate model

23 health index of the process performance of the plurality of

24 process outputs; and

1   if the first process health index and the second

2 process health index are calculated, calculating an

3 aggregate process health index of the process performance of

4 the plurality of process outputs.

5   66. A computer-readable medium of instructions for

6 monitoring performance of an advanced process control system

7 for at least one process output, the instructions

8 comprising:

9   estimating a process deviation, wherein the process

10 deviation indicates deviation of a process performance from

11 at least one of a target process performance and a model of

12 the process performance;

13   characterizing a current estimate of the process

14 performance using at least one of a first index that

15 represents the deviation of the process performance from the

16 target process performance and a second index that

17 represents the deviation of the model performance from a

18 specified model performance; and

19   performing a notification function based on the value

20 of at least one of the first index and the second index